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Reconciliating Conservation and Sustainable Use of Biodiversity

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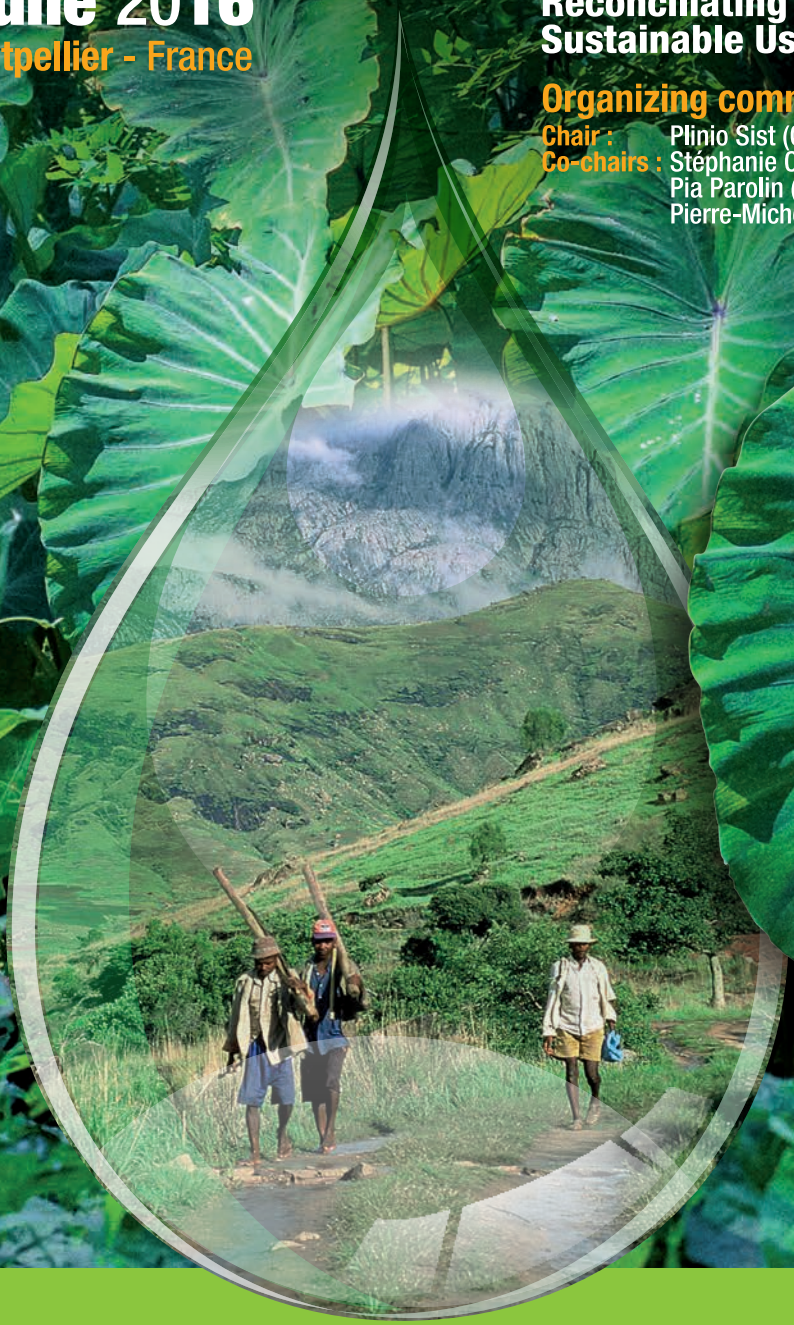

PROGRAM & ABSTRACTS

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O59-03 – S59 *Mapping and monitoring tropical forest degradation with remote sensing*
Thursday 23 June / 14:30-17:00 – Sully1

Carbon losses due to tropical forest fragmentation: a forgotten process in the global carbon cycle?

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Tropical forests play an important role in the global carbon cycle. Thereby, deforestation is not only responsible for direct carbon emissions but also alters the forest structure and extends the forest edge area in which trees suffer increased mortality due to altered microclimatic conditions. Our aim is to quantify the global amount of anthropogenically created forest edge area and the resulting additional CO2-emissions by combining remote sensing data with previous empirical and modelling results.
We found that 1,106 million ha and thereby 10% of the global tropical forested area lies within the forest edge area and that 84% of this area is anthropogenically created. From this area, a total amount of 8 Gt C is emitted due to tropical forest fragmentation, which accounts for an annual loss of 0.25 Gt C equaling 17% of the annual carbon losses due to deforestation. Fragmentation in the tropics hence augments carbon loss from deforestation substantially and should be taken into account both when analyzing the role of vegetation in the global carbon balance and when adopting new management strategies in tropical forests.

O59-04 – S59 *Mapping and monitoring tropical forest degradation with remote sensing*
Thursday 23 June / 14:30-17:00 – Sully1

Remote sensing indicators to monitor forest degradation trough time in the Brazilian Amazon

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Recently, several remote sensing methods have been developed to quantify the degradation of tropical forests. However, it still lacks finest spatial and temporal analysis to define trajectories of forest degradation i.e. a temporal analysis of the impacts on forest integrity. This communication aims to explore this issue and proposes a set of operational indicators to monitor forest degradation, which can constitutes a decision tool to support forestry managers and policy makers.
We studied the trajectories of forest degradation in the municipality of Paragominas – PA in the eastern Brazilian Amazon between 1995 and 2009, with a focus on the forestry company Cikel (400 000 ha certified by FSC since 2001).
First, we developed a semi-automatic remote sensing methodology to detect forest degradation using multi-temporal Landsat images (spatial resolution of 30m) covering the 1995-2009 period. This method included two steps: 1) Identification of logging tracks and log landings using an algorithm of Bourbier et al. (2013). This algorithm uses spectral indices and morphological filters to strengthen the spectral contrasts between bare soil and forest cover. 2) Identification of logging gaps - which are characterised by senescent vegetation due to trees fall - using a Spectral Mixture Analysis carried out in CLASlite (Asner et al., 2009) and a fraction index (Souza et al., 2013). So, we obtained annual maps identifying these three major impacts.
Secondly, we calculated annual landscape metrics of forest degradation using the R package «SpatialEco». Then, we calculated indicators which synthetize information about logging impacts and logging frequencies over the period from these annual degradation metrics. Finally, we selected a set of 6 indicators and statistically analysed the trajectories of degradation occurring in Paragominas using ACP and CAH.
Our results emphasize four major degradation trajectories from well managed forests to highly-logged forests. They clearly show a difference between legal and illegal logging in terms of forest degradation. Moreover, they indicate that impacts of FSC certification on forest degradation was positive. Degradation was statistically lower in the certified logged plots compared to the uncertified plots. These set of indicators are adequate to monitor forest degradation through space and provide guidance to policy-makers for a better management of forest resources.